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(21)Application number : 2001-288587 (71)Applicant : KONICA CORP

(22)Date of filing : 21.09.2001 (72)Inventor : HOSAKA TAKAO
TAKABA TETSUSHI
MIYATA KYOSEI
KOBAYASHI HIROYUKI
TAKAYAMA ATSUSHI
SATO KOICHI
KITADA TAKEKATSU

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(54) PHOTOGRAPHING APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a photographing apparatus for photographing under more appropriate conditions by maintaining the cost to be low.
SOLUTION: Light from a subject passes through color filters FG, FR, and FB, and is received by a first group of pixels 50a. However, since the light does not pass through the color filters but is received by a second group of pixels 50b, a second group of pixels 50b can directly detect light from the actual subject, thus improving the accuracy in data for photometry.

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CLAIMS

[Claim(s)]

[Claim 1] It is photography equipment characterized by light being received by the pixel of said 2nd group, without passing said color filter although it has the image sensor which has arranged the pixel of the 1st group for a photographic subject image image pick-up, and the pixel of the 2nd group for a photometry two-dimensional, and a color filter, the light from a photographic subject passes said color filter and light is received by the pixel of said 1st group.

[Claim 2] It is photography equipment according to claim 1 characterized by being covered with the filter of a color with which the pixels of said 1st remaining

group differ when said color filter has wrap structure with either of the filters of three colors in each pixel which makes 1 block the pixel of two-line two trains and one pixel of said 2nd group is included in a 1-block pixel.

[Claim 3] The image sensor which has arranged the pixel of the 1st group for a photographic subject image image pick-up, and the pixel of the 2nd group for a photometry two-dimensional, It has a color filter containing the filter of the 1st color, the 2nd color, and the 3rd color. The pixel of said 2nd group The 1st pixel which receives a photographic subject image through the filter of said 1st color, and the 2nd pixel which receives a photographic subject image through the filter of said 2nd color, Photography equipment characterized by obtaining the data for a photometry based on said 1st [the], the 2nd, and the output value of the 3rd pixel including the 3rd pixel which receives a photographic subject image through the filter of said 3rd color.

[Claim 4] Photography equipment according to claim 3 characterized by carrying out weighting to said 1st [the], the 2nd, and the output value of the 3rd pixel, and obtaining the data for a photometry.

[Claim 5] Said color filter is photography equipment according to claim 1 to 4 characterized by including red and a green and blue filter.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to still picture photography equipments, such as an electronic "still" camera which enabled it to control light exposure using the electronic shutter ability of a solid state image sensor, and a photodetection function, in more detail about photography equipment.

[0002]

[Description of the Prior Art] The electronic "still" camera like the digital still camera which changes an optical image into image data and can memorize it by development of the electronic technique in recent years is developed and marketed. By the way, with a common electronic "still" camera, a photometry is started by the half-push of a release switch using an image sensor, and a photograph is taken with the shutter speed and the diameter of a diaphragm based on said photometry result at the time of all push.

[0003]

[Problem(s) to be Solved by the Invention] However, on a scene from which

photographic subject brightness changes, the field brightness in the phase [push / the release switch / the phase / half-] differs from the field brightness when all push [a release switch], and there is a possibility that unsuitable exposure may be performed by that cause.

[0004] On the other hand, if the component for a photometry is prepared separately, since the midst which is performing photo electric conversion with the image sensor at the time of release can also perform photometry actuation, according to change of field brightness, shutter speed can be sped up, or it can be made late, and, thereby, proper exposure can be performed. However, if a photometry component is prepared separately, the cost of an electronic "still" camera will increase and the problem of enlarging will arise.

[0005] Since the CMOS mold image sensor of a configuration of differing from CCD to this problem has the property that it is possible to take out only the charge accumulated in the specific pixel, it takes out the charge accumulated in the pixel of the center in the pixel arranged in the shape of two-dimensional, using it, and has the attempt in which it uses as data for a photometry. However, when the CMOS mold image sensor is usually equipped with the color filter and it uses the output from a specific pixel as an object for a photometry, it is a

problem how a color filter is dealt with.

[0006] It aims at offering the photography equipment which can take a photograph on more proper photography conditions, this invention being made in view of the trouble of this conventional technique, and maintaining cost low.

[0007]

[Means for Solving the Problem] Although the photography equipment of the 1st this invention has the image sensor which has arranged the pixel of the 1st group for a photographic subject image image pick-up, and the pixel of the 2nd group for a photometry two-dimensional, and a color filter, the light from a photographic subject passes said color filter and light is received by the pixel of said 1st group Since light is received by the pixel of said 2nd group, without passing said color filter, since the pixel of said 2nd group can carry out direct detection of the light from an actual photographic subject, it can raise the precision of the data for a photometry.

[0008] Furthermore, when said color filter has wrap structure with either of the filters of three colors in each pixel which makes 1 block the pixel of two-line two trains and one pixel of said 2nd group is included in a 1-block pixel, when the pixel of said 1st remaining group is covered with the filter of a different color, it is

desirable. That is, if a color filter in three primary colors is used to the pixel of two-line two trains, only Isshiki will increase, for example like green, red, blue, and green. Then, in this case, by extracting or changing the filter of green transparence into a colorless filter, the pixel corresponding to it can be made into the pixel of the 2nd group, the remaining pixels can be made into the pixel of the 1st group which prepared the filter with a color [each / every] of one, and deterioration of image quality can be prevented.

[0009] The image sensor with which the photography equipment of the 2nd this invention has arranged the pixel of the 1st group for a photographic subject image image pick-up, and the pixel of the 2nd group for a photometry two-dimensional, It has a color filter containing the filter of the 1st color, the 2nd color, and the 3rd color. The pixel of said 2nd group The 1st pixel which receives a photographic subject image through the filter of said 1st color, and the 2nd pixel which receives a photographic subject image through the filter of said 2nd color, Since the data for a photometry are obtained based on said 1st [the], the 2nd, and the output value of the 3rd pixel including the 3rd pixel which receives a photographic subject image through the filter of said 3rd color, the photometry according to the color temperature of a photography scene or the property of

stroboscope light can be performed. In addition, when weighting of said 1st [the], the 2nd, and the output value of the 3rd pixel is carried out, the photometry data which performed suitable exposure, for example to main photographic subjects will be obtained.

[0010] Although said color filter is desirable when it contains red and a green and blue filter, it is not restricted to this.

[0011] In addition, in the image sensor concerning this invention, the pixel of the 2nd group can consider taking out an output by it turning ON (discharge condition) at coincidence, when the condition of discharge **********, i.e., a pixel, is plurality, or an output signal (accumulated charge) accessing periodically at high speed. When there are two or more pixels of the 2nd group, it is good to scan changing a pixel at high speed. When this is detected by one place or two or more places, for example, stroboscope luminescence is performed, output change of a short time from immediately after luminescence is observed by detecting the charge of the pixel of the 2nd group, and the signal for stopping luminescence of stroboscope light in the place beyond a certain threshold is outputted. If the pixel of the 2nd group is used as an object for exposure control, it can interpolate from a surrounding pixel like a defect pixel later.

[0012] Preparing the pixel of the 2nd group only for [for exposure control] data acquisition in image pick-up circles besides using a part of pixel located in a line with two-dimensional is also considered. For example, although the effect on image quality decreases when a photo detector is prepared between pixels, there are problems, like wiring fields increase in number. Arranging a pixel or a photo detector around the image pick-up section is also considered. Moreover, preparing the photo detector located in a line in the shape of Rhine instead of an independent pixel is also considered. Dividing into the data for exposure control and image data the charge accumulated in the pixel of the 2nd group is also considered. Although the output of a pixel becomes smaller than the output of the pixel for image data ejection at this time, there is an advantage that degradation of image quality becomes small rather than the direction which amplified this interpolates and asks from a surrounding pixel.

[0013] Furthermore, if it is a pixel (namely, pixel which can calculate the amount of charges in which charge discharge was not performed but ** was also accumulated) with the component structure whose destructive read is possible, the signal of the pixel of the 2nd group established for the data acquisition for exposure control can also be used as image data. In this case, it is desirable

after terminating exposure, when modulated light RE ** RU which compared the data read, for example before stroboscope luminescence with the data read after luminescence, and was set up beforehand is exceeded.

[0014]

[Embodiment of the Invention] Hereafter, before explaining the gestalt of this operation with reference to a drawing, the outline of a CMOS mold image sensor is explained. Drawing 1 is the representative circuit schematic of a CMOS mold image sensor. In drawing 1 , although only the single pixel 50 is shown, it comes to arrange this pixel 50 two-dimensional. Circuits, such as a timing generator 51, the perpendicular shift register 52, the level shift register 53, and the output amplifier 54, are constituted by the outside of a pixel 50. The perpendicular shift register 52 is a register which chooses the scanning line, and the level shift register 53 is a register which chooses the pixel 50 in the same scanning line. A timing generator 51 controls the whole sensor including these. In addition, it is possible besides the above-mentioned configuration a CDS circuit, an AD converter, and to incorporate a digital disposal circuit etc. further.

[0015] Serial communication can perform a setup of the timing generator 51 interior from the outside. In drawing 1 , although the view only of the input of a

command is carried out, the serial communication of two lines or 3 line type is assumed. By this serial communication, a setup of the register of the timing generator 51 interior is performed, and a change etc. can be made. Since the terminal (TRG1, TRG2) of dedication is prepared apart from this serial communication as an exposure control signal, it will be transmitted through this terminal.

[0016] Although some can be considered as the approach of control of an image sensor, he starts exposure in the standup of the pulse of a trigger signal TRG1, and is trying to end exposure in falling of a pulse in the gestalt of this operation. And if it becomes proper light exposure and a trigger signal TRG2 starts before falling of the pulse after a standup of the pulse of a trigger signal TRG1, exposure will be completed at the time.

[0017] More concretely, if actuation of each part is explained, in drawing 1 , it will be carried out in the photosensor section (namely, photodiode) D1 in a pixel 50 by which light-receiving of operation is connected to the power source Vrst1 through MOS transistor Q2 by sweeping out. When sweeping out the charge of a photodiode D1, the output signal RG 1 of a timing generator 51 is controlled, and a charge is swept out to a power source Vrst1 by turning on a transistor Q2. By

turning on MOS transistor Q2 of all pixels, the charge of all photodiodes is swept out and exposure is started from the time of turning off a transistor Q2. This part is equivalent to the charge discharge section.

[0018] The photodiode D1 is further connected to the capacitor C1 through MOS transistor Q1 for the charge transfer. This part is equivalent to the charge storage section. The charge of a photodiode D1 is transmitted to a capacitor C1 by controlling the output signal SG of a timing generator 51, and turning on MOS transistor Q1 of all pixels. Furthermore, exposure is completed by turning off a transistor Q1.

[0019] Next, read-out of a charge is explained. The charge accumulated in the capacitor C1 of each pixel is read to the 1-pixel [every] (or one line) exterior through a transistor Q4 by turning on MOS transistor Q5. Selection of a pixel is performed by specifying the address (turning on a transistor Q6 here) with the perpendicular shift register 52 and the level shift register 53. That is, a charge can be read only from the addressed pixel. Although it is also possible to read a charge as it is at this time, since it is easy to be influenced of a noise, in the gestalt of this operation, it is once changing and outputting to the electrical potential difference.

[0020] Then, reset of the charge storage section accomplishes. The charge of a capacitor C1 can be swept out to a power source Vrst2 by turning on MOS transistor Q3 in coincidence, by the time the next photography is more specifically started, after read-out is completed (it clears namely, resets to a power source Vrst2). when carrying out to all pixel coincidence at this time, since the amount of dark current noises between pixels was made equal, it was desirable, but when the amount generating of noises was sufficiently small, read-out finished -- 1 more pixel is good at a time in a line. With the amplifier 55 of the output section, current amplification of this charge is carried out, and it is outputted.

[0021] The reset function of a photodiode D1 is omissible. In that case, a transistor Q2 will be omitted. In this case, by transmitting a charge to a capacitor C1, a photodiode D1 can be cleared and exposure can be started from there. The charge transmitted to the capacitor C1 will be read during an exposure period, and will be thrown away.

[0022] Furthermore, as a modification, the case where nonvolatile memory (charge storage section) is prepared is explained. It is good to transmit a charge to the charge storage section which is not nonvolatile from the photosensor

section first at all pixel coincidence in the image sensor equipped with the charge storage section which is not nonvolatile, and the charge storage section of a non-volatile, and to transmit 1 pixel of charges at a time to the charge storage section of a non-volatile one by one after that. Generally drawing speed of a flash memory is slow, and since this requires time amount for writing, it is for doubling the timing of writing.

[0023] Drawing 2 is the outline block diagram of the image sensor circuit 20 containing the image sensor of drawing 1 . As mentioned above, each pixel 50 (drawing 1) of the image pick-up section 54 which comes to arrange the pixel 50 shown in drawing 1 two-dimensional is respectively controlled by the perpendicular shift register 52 and the level shift register 53 which are controlled by the image sensor control circuit 23 (a timing generator is included) which receives a control signal from MPU27, and operates.

[0024] In the gestalt of this operation, a part of pixel 50 is a pixel (pixel of the 2nd group) for performing the photometry which detects the light from a photographic subject for exposure control, and the remaining pixels (pixel of the 1st group) have the function to change a photographic subject image into image data. therefore, the output signal from the pixel of the 1st group should pass output

terminal 55a -- be amplified with the output amplifier 55, be outputted to the exterior of the image sensor circuit 20, and the output signal from the pixel of the 2nd group should pass output terminal 56a -- it is amplified with the output amplifier 56, and it is a comparator 7, and is compared with predetermined photometry level (threshold), and the result is outputted to the image sensor control circuit 23. As shown in drawing 2 , the image pick-up section 54, the perpendicular shift register 52, the level shift register 53, the image sensor control circuit 23, the output amplifier 55 and 56, and a comparator 7 are one-chip-ized. Moreover, although the one-chip-ized circuit is not illustrated, it also builds in the register and DA converter for setting up photometry level, and also has the communication facility for rewriting this register from the exterior and changing photometry level further.

[0025] Drawing 3 is the outline block diagram showing the array of the pixel in the image pick-up section 54. In pixel 50a of the 1st group arranged by two-dimensional, pixel 50b (hatching shows) of the 2nd group is arranged at the predetermined spacing. In the gestalt of this operation, in a general-purpose CMOS mold image sensor, it is using as a pixel for exposure control, and a part of pixel for obtaining image data is made with a low cost configuration. In

addition, according to this configuration, since a part of image data will be used as data for exposure control, a condition equivalent to a pixel defect (the so-called black crack) will arise in the location of the pixel of the 2nd group, but since this pixel defect can be amended from the image data of a perimeter pixel like the black crack which may usually be produced, it is thought that a big problem is not produced. Moreover, as the number of pixel 50b of the 2nd group, supposing there is 1 pixels [M pixels] pixel 50a of the 1st group, when there are 30 to about 100, it is desirable. Pixel 50b of the 2nd group is good in it being in the condition which it is specified with the address and is always outputted. In this case, the output of the pixel which has more than one is doubled, and it can do with one output. Pixel 50b of the 2nd group may be arranged only in the center, and may be arranged at intervals of predetermined over the image pick-up section 50 whole.

[0026] Drawing 4 is a plugging chart for signal ejection at the time of using the image pick-up section of drawing 3 . As shown in drawing 4 , pixel 50a of the 1st group and pixel 50b of the 2nd group are connected by the respectively independent wiring W2 and W1 to the output amplifier 55 and 56.

[0027] Drawing 5 is the outline block diagram showing the array of the pixel in

the image pick-up section 54 concerning the modification of the gestalt of this operation. Between pixel 50a of the 1st group arranged by two-dimensional, pixel 50b (hatching shows) of the 2nd group is arranged. In the gestalt of this operation, since a pixel defect is not produced unlike the configuration of drawing 3 of what needs to manufacture a CMOS mold image sensor at dedication (wiring only for pixel 50b of the 2nd group is included), image quality is highly maintainable.

[0028] Drawing 6 is a plugging chart for signal ejection at the time of using the image pick-up section of drawing 5 . As shown in drawing 6 , pixel 50a of the 1st group and pixel 50b of the 2nd group are connected by the respectively independent wiring W2 and W1 to the output amplifier 55 and 56.

[0029] Drawing 7 is drawing showing the arrangement relation between a pixel and a filter. Two-line two trains were dealt with as a 1-pixel block among the pixels of many ****** located in a line two-dimensional, and the image data for 1 pixel is taken out from these. The 1-pixel block containing the pixel for a photometry is arranged as shown in drawing 7 . Here, two [upper] and left one are become to pixel 50a of the 1st group, and the one remaining has become pixel 50b of the 2nd group by a diagram. a color filter -- pixel 50a of the 1st group

-- receiving -- the green filter FG, the red filter FR, and the blue filter FB -- a wrap (it arranges to a photographic subject side) -- it is made like. As for pixel 50b of the 2nd group, the filter of any colors is not covered. In addition, in other pixel blocks, since pixel 50a of the 1st group is arranged instead of pixel 50b of the 2nd group, the green filter FG (un-illustrating) is arranged in the location corresponding to this.

[0030] Thus, the light from a photographic subject can be directly received by pixel 50a of the 2nd group, and the high data for a photometry of precision can be formed because the filter of any colors does not cover pixel 50b of the 2nd group. In addition, a transparent and colorless filter may be attached instead of extracting the filter of the location corresponding to pixel 50b of the 2nd group, as mentioned above.

[0031] Drawing 8 is drawing showing another arrangement relation between a pixel and a filter. All the pixels of a 1-pixel block are set to pixel 50b of the 2nd group in this example. On the right, it arranges from the top by a diagram in order of the green filter FG, the red filter FR, the blue filter FB, and the green filter FG.

[0032] Thus, the amount of the light which passed the filter of each color can be

separately calculated by pixel 50b of the 2nd group by setting all 1-pixel blocks to pixel 50b of the 2nd group, and covering with the filter of a different color. By changing the ratio (weighting) of the output value of each pixel at this time, the spectral sensitivity characteristic of a photo detector is also changeable according to the color temperature and stroboscope property of for example, a photography scene.

[0033] There are the following as an approach of reading a signal from the pixel of the 2nd group.

1) How to access all photo detectors at coincidence, read a signal to coincidence, and add and take it out. In this case, XY address is specified that the output transistor of all photo detectors turns on, and a signal is read.

2) The approach which changes 1 pixel at a time at high speed, and is read. In this case, also when using a stroboscope, it is necessary to take into consideration, and it is necessary to read a signal with a sufficiently early time interval to the luminescence time amount of stroboscope light. The signal read 1 pixel at a time is added externally.

3) The approach which combined the above. It is the approach of dividing a photo detector into some groups and reading it for every group.

[0034] It can measure the strength of the light, without using a complicated circuit and a complicated photometry algorithm while it can perform an early photometry of a speed of response, since the approach of 1) adds a signal and detects it at once. texture which mentions the approach of 2) later although the access speed for about 10 or less ns is needed several 10 or less ns if it can do when the pixel of the 2nd group is made into about 100 pieces, although it is dependent also on the number of photo detectors since the luminescence time amount of stroboscope light is about hundreds of microseconds -- warm photometry control can be performed. The approach of 3) is the middle and has both advantages and demerit. For example, the signal of the photo detector for one column is read to coincidence, and it becomes the form which changes it in order and reads it over all columns.

[0035] When reading according to an individual, a signal can be used accommodative. Since a signal can be read for every pixel in the case of a CMOS mold image sensor, paying attention to the large pixel of change, a signal can be used after stroboscope luminescence at the time of speed light photography, for example. Although a signal is read from the pixel of all the 2nd group at first, if there is a large pixel of the change after stroboscope

luminescence, some of them or all will be chosen and only the signal from the pixel will be read. When it is got blocked, for example, a person is photoed, the strength of the light will be measured paying attention to a face and the part which wants to measure the amounts of reflected lights, such as the body. Moreover, the part whose number of pixels of the 2nd group used in this case decreases, and a read-out cycle become short, the resolution of the direction of a time-axis becomes high, and the high photometry of precision of it is attained more. Moreover, when preparing the pixel of the 2nd group of dedication, a read-out circuit can also be established in dedication. Although an output circuit can also be established in dedication, it can also carry out to the output of a picture signal in common.

[0036] Drawing 9 is drawing showing the outline configuration of the electronic "still" camera which is an example of the photography equipment concerning the gestalt of this operation. In drawing 9 , 27 is MPU which determines a diaphragm and shutter speed or outputs a control signal to various circuits, 120 is a luminescence circuit which makes the stroboscope 2 which is luminescence equipment emit light in response to the trigger signal (luminescence start signal) from MPU27, 21 is a taking lens which condenses the reflected light from a

photographic subject 3, and 22 is a CMOS mold image sensor shown in drawing 1 . 23 is an image sensor control circuit which performs light exposure control of an image sensor 22 in response to the stop signal from the comparator 7 which is the decision section. Thus, the actuation of the constituted electronic "still" camera is as follows.

[0037] Actuation of the gestalt of this operation is explained referring to the stroboscope luminescence property Fig. shown in drawing 10 . It is a stroboscope luminescence curve when the curve f shown in drawing 10 carries out full luminescence of the stroboscope 2. Only the longest luminescence time amount T2 (usually 50 microseconds - 500 microseconds) of a stroboscope 2 makes a stroboscope 2 emit light at the short paddle time of day tx with the gestalt of this operation from the time of day ts which a shutter closes based on the time of the shutter second at the time of the stroboscope mode set up beforehand (for example, equivalent to t1-ts of drawing in 1 / 60 seconds) (the amount of luminescence is not controlled but is good at full luminescence.). In addition, with the gestalt of this operation, when the brightness of a photographic subject was measured, the time of a diaphragm and a shutter second is decided by MPU27 and the time of a shutter second exceeds 1 / 60 seconds by the light

which carried out incidence through the taking lens 21 first at pixel 50b (drawing 3) of the 2nd group of an image sensor 22 in the case of the usual AE mode, stroboscope mode is chosen automatically. When the image sensor control circuit 23 gives a signal TRG1 now to a timing generator 51 in time of day t1, exposure is started by sweeping out the charge in the photosensor section (photodiode D1 of drawing 1).

[0038] Next, when a trigger enters from MPU27 in time of day tx, a stroboscope 2 is made, as for the luminescence circuit 120, to emit light after predetermined time progress. A photographic subject 3 is irradiated by stroboscope luminescence. Incidence of the reflected light from a photographic subject 3 is carried out to an image sensor 22 through a taking lens 21. In the meantime, the amount of stroboscope luminescence increases rapidly, as shown in drawing 10 . Moreover, in time of day tx, an integral start signal goes into an integrating circuit (un-illustrating) from MPU27 at a stroboscope flashing caution signal and coincidence. Thereby, the integral of stroboscope light starts.

[0039] An integrating circuit integrates with the output of pixel 50b of the 2nd group, and the output increases with time amount. And a comparator 7 operates by time-of-day ts' to which the output reached the modulated light level of the

criteria defined beforehand, and a stop signal is outputted. A stop signal may be outputted through MPU27 from a comparator 7.

[0040] The image sensor control circuit 23 will end exposure actuation of an image sensor 22 by outputting a signal TRG2 to a timing generator 51 (drawing 1), if this stop signal is received. Thereby, the image information of the photographic subject 3 in the optimal exposure condition is memorized by the charge storage section in each pixel. Although the reset time of an image sensor 22 becomes t1 - ts' and only (ts-ts') becomes short from the first setup (t1-ts) at this time, this amount is very short, since it is (ts-t1>>ts-ts'), it does not become a problem, and since it is not a figure with especially semantics, it does not become a problem at all from the first at the time of the shutter second at the time of stroboscope mode (for example, 1/60 second t1-ts).

[0041] On the other hand, after time-of-day ts' progress continues luminescence, and a stroboscope 2 quenches it at time of day ts (the time amount to which the stroboscope 2 is emitting light is T2). The light exposure of a part which integrated with Field A to the image sensor 22, and became an image, and Field B are the light exposure of the part which did not contribute to image formation. Thus, the amount of charge charges at the time of reaching the optimal light

exposure can be memorized in the storage section, without control of the precise amount of luminescence stopping difficult stroboscope luminescence on the way according to the gestalt of this operation. Consequently, light exposure is controllable with high precision with an easy configuration at the time of stroboscope luminescence.

[0042] The view of the above-mentioned exposure control is the same as the above-mentioned example, if it can apply in the daytime also at the time of a synchro (it is making a stroboscope emit light when a photographic subject is a backlight, and the photographic subject image of suitable exposure can be taken) and the time of the shutter second set up at first (equivalent to 1 / 60 seconds of said example) removes the point which changes with the brightness of a photographic subject at this time. However, since said ts-t1 >>ts-ts' will stop realizing and exposure precision will be affected at this time if the time of a shutter second becomes short not much, the device of making a diaphragm small at this time and making it the time of a shutter second become to some extent long etc. is required. An example is given and explained. For example, the light exposure set up immediately after a stroboscope emitted light is reached, and suppose that the shutter closed. That is, suppose mostly that only

the longest luminescence time amount of a stroboscope had the gap at the time of a shutter second (ts-ts').

[0043] In order to set the gap at the time of a shutter second to less than -0.2 EVs, it is the shutter speed x in which yms and speed light photography are possible about stroboscope luminescence time amount. It is set to ms, then y< (1-2-0.2) x. Therefore, by stroboscope luminescence time amount making even 1/500 possible 517 or less microseconds, for stroboscope luminescence time amount's making even 1/1000 possible 258 or less microseconds, stroboscope luminescence time amount becomes 129 or less microseconds making even 1/250 possible at the time of a shutter second. Moreover, in order to set the gap at the time of a shutter second to less than -0.4 EVs Since it is y< (1-2-0.4) x similarly, if it is to 1/250 at the time of a shutter second, 968 or less microseconds, Although the photographic subject which the stroboscope has hit is proper exposure when it has been 121 or less microseconds 242 or less microseconds if it is to 1/2000, and the gap at the time of a shutter second is large if it is to 1/500 and is to 484 or less microseconds and 1/1000 The part which stroboscope light does not reach will become a underexposure or exposure over.

[0044] Moreover, the stroboscope longest luminescence time amount (50 microseconds - 500 microseconds) can be interlocked with the distance information which is not illustrated instead of immobilization from AF (automatic focus) system. For example, if x (photographic subject distance) (diaphragm) is small, since a setting diaphragm is considered and it unites, and there will be few amounts of luminescence and they will end, ts-tx can be estimated small. If x (photographic subject distance) (diaphragm) is large to this and reverse, many amounts of luminescence are needed and can estimate ts-tx for a long time.

[0045] Drawing 12 is drawing in which x (photographic subject distance) (diaphragm) showed the stroboscope luminescence property at the adult time for the stroboscope luminescence property in case x (photographic subject distance) (diaphragm) of drawing 11 is smallness, respectively. Since the amount of luminescence has little x (photographic subject distance) (diaphragm) and it ends when small as mentioned above, area A becomes small as shown in drawing 11 . On the other hand, x (photographic subject distance) (diaphragm) is [many amounts of luminescence] needed in being large, and area A becomes large as shown in drawing 12 .

[0046] If such an approach is used, even if the time of a shutter second becomes

short in the daytime which was mentioned above at the time of a synchro, since ts'-tx is estimated, ts-ts' can be shortened and an error can be made fewer than said example. Therefore, a high-speed Japan-China synchro is attained more. Of course, when ts' becomes behind from ts, ts set up first is disregarded, and the integral of a solid state image sensor continues until it is outputted to to ts' (i.e., a stop signal). However, although not shown by a diagram, when the amount of luminescence is insufficient and a stop signal does not come out, the charge with which the photosensor section was accumulated by one of ts or ts' is discharged. That is, a shutter is closed. Or the charge with which the photosensor section was compulsorily accumulated in the time of the shutter second of the defensive hand blurring limitation that time amount still longer than ts or ts' passed, or the latest shutter second (for example, 1 / 60 seconds) (for example, 1 / 8 seconds) etc. is transmitted, and you may make it end exposure.

[0047] Next, the photography flows of control of the gestalt of this operation shown in drawing 13 are explained. At step S101 of drawing 13 , if a photography person does ON actuation of the main switch, power will be supplied to each part at step S102, and the capacitor (un-illustrating) in the stroboscope luminescence circuit 120 will be charged by step S103. Only when

required, it may be made to perform stroboscope charge. When waiting and a release carbon button are pushed, that a photography person pushes a release carbon button (un-illustrating) at step S104 at step S105 furthermore, MPU27 After starting the exposure control for exposure control using the output of pixel 50b (or pixel 50a of the 1st group or both sides) of the 2nd group and completing exposure control at step S106, stroboscope luminescence judges whether it is the need at step S107. Although it thinks [that it is various as a mode of exposure control, and], the optimal exposure conditions can be determined based on the data (or data by which weighting was carried out for every color of a filter) continuously read from pixel 50b of the 2nd group.

[0048] In this case, since the photographic subject illuminance is low, when it is judged that stroboscope luminescence is required, MPU27 starts exposure at step S108, sends a trigger signal to the luminescence circuit 120 at step S109, and makes a stroboscope 2 emit light.

[0049] Signal read-out from pixel 50b of the 2nd group is started after exposure initiation or from just before luminescence. An output is read for every clock and the output value is checked. Pixel 50b of each 2nd group uses a pixel signal as it is. The signal from each pixel is read to coincidence for every clock. That is, the

output of each pixel will be added and read. It is equivalent to resetting each pixel beginning read-out from before stroboscope luminescence, i.e., before luminescence.

[0050] It judges whether at step S110, the amount of stroboscope luminescence exceeds the predetermined value based on the output from pixel 50b of the 2nd group. If it judges that the amount of stroboscope luminescence exceeded the predetermined value, MPU27 will terminate termination or exposure for stroboscope luminescence compulsorily by sending a termination signal to the luminescence circuit 120 (a termination or charge discharge of the 1st group of the charge storage of pixel 50a). On the other hand, if it judges that the amount of stroboscope luminescence does not exceed, MPU27 will complete exposure actuation at waiting and step S114 until the exposure time which is a schedule is completed at step S113.

[0051] On the other hand, since the photographic subject illuminance is high, when it is judged that stroboscope luminescence is unnecessary, without performing stroboscope luminescence, MPU27 starts exposure at step S112, and it completes exposure actuation at waiting and step S114 until the exposure time which is a schedule at step S113 is completed.

[0052] Then, MPU27 reads a picture signal from pixel 50a of the 1st group, and non-illustrated memory is made to memorize it by step S16 at step S115. Supply of a power source is intercepted if needed (step S117).

[0053] If supplementary information of the above control is carried out, he is trying for after stroboscope luminescence to integrate with the pixel signal of pixel 50b of the 2nd group which made luminescence the trigger and was read after luminescence for every clock. When a threshold is reached as compared with the threshold (modulated light level) which set up beforehand the value with which it integrated in the comparator 7, a stop signal is taken out to an image sensor control circuit, and exposure is terminated by closing the electronic shutter of an image sensor.

[0054] Where a signal line is linked directly, an output may be taken out from the pixel which carried out RISETSU ** once and which was cleared besides a signal taking out and reading for every clock as a direction. In this case, a pixel will be integrated with stroboscope light. It is good for a comparator 7 to compare the signal adding the output of each pixel (photo detector). Although later mentioned with reference to drawing 14 , pixel 50b of the 2nd group can also be sorted out depending on the case. for example, -- high -- when the pixel which is

receiving the light from a brightness photographic subject is made into the pixel of the 2nd group, it cannot ignore to stroboscope luminous intensity When the output of such a pixel is used as an object for modulated light control, an error may arise in quantity of light detection of stroboscope light. In order to eliminate this, it detects whether the pixel of the 2nd group is scanned beforehand and high brightness photographic subject light is received, and when light is being received, it excepts so that this pixel may not be used as a photo detector. However, since stroboscope light emits a strong light relatively [short time], the effect of the ordinary light within luminescence time amount may be able to be disregarded, and selection may be omitted in that case.

[0055] With the gestalt of this operation, if the output of the pixel of the 2nd group reaches the modulated light level set up beforehand, a stop signal will be outputted from a comparator 7 and it will be inputted into it in the image sensor control circuit 23. Thereby, an image sensor control circuit terminates exposure of an image sensor. The above-mentioned function can also be made to accumulate on an image sensor 22. A setup of modulated light RE ** RU etc. may be performed from the outside.

[0056] When using the pixel of a color image sensor as a pixel of the 2nd group,

in the filter of BGR, there are an approach of representing with the pixel of Green and a method of choosing the pixel of each BGR with sufficient balance, and representing it. It is also possible to carry color filter only with the another pixel of the 2nd group, or not carrying is also possible.

[0057] Drawing 14 is drawing showing the photography flows of control explained to a detail about the modification of stroboscope exposure control of drawing 13 . About this modification, the control at the time of Wright solving, for example and the light from high brightness photographic subjects, such as an emitter, carrying out incidence to the pixel of the 2nd group is shown. By step S106 of drawing 13 , after exposure control is completed, MPU27 judges whether pixel 50b of the 2nd group which received the light from a high brightness photographic subject should be divided at step S201 of drawing 14 . a pixel should be divided -- ** -- when it judges, MPU27 scans pixel 50b of the 2nd group at high speed (the output of each pixel is investigated). Judging that it is not the light from a high brightness photographic subject if the output of one of pixels is lower than default value (threshold), MPU27 registers this pixel. Judging that it is the light from a high brightness photographic subject with [the output of one of pixels] default value [beyond] (threshold) on the other hand, MPU27

excepts this pixel and performs stroboscope modulated light. Although a threshold may be a fixed value, when there are three or more pixel signals, the average is calculated and excepting the pixel signal which was widely different from the average is also considered.

[0058] When the scan of pixel 50b of all the 2nd group is completed at step S206, When it is judged that it is not necessary to divide pixel 50b of the 2nd group which received the light from a high brightness photographic subject at step S201, or MPU27 Exposure is started at step S207, pixel 50b of the 2nd group is reset at step S208, and a stroboscope 2 is made to emit light through the stroboscope luminescence circuit 120 at step S209. At step S210, then, MPU27 The signal outputted from pixel 50a of the 2nd group is read. At step S211 If it integrated with this signal and is the integral value over it as compared with default value (threshold), will stop stroboscope luminescence by step S214, or end exposure (a termination or charge discharge of the 1st group of the charge storage of pixel 50a), and if it does not exceed After waiting for a predetermined time to pass at step S213, exposure is ended at step S114 of drawing 13 .

[0059] Pixel 50a of the 1st group for image data acquisition and pixel 50b of the 2nd group for the data acquisition for exposure control are made to become

independent with the gestalt of this operation described above. However, since the amount can be checked without taking out the pixel in which the so-called destructive read is possible, then the accumulated charge for pixel 50b of the 2nd group, the charge accumulated in pixel 50b of the 2nd group can be used as a part of image data, and, thereby, improvement in image quality can be aimed at. Moreover, after finishing discharging the charge of pixel 50b of the 2nd group for integral initiation, and changing into the condition that the charge of pixel 50a of the 1st group can be outputted, you may carry out.

[0060] Thus, if a CMOS mold image sensor is used, since the charge of the pixel of arbitration can be read, like the gestalt of this operation, the photo detector for measuring field brightness which could use a part of pixel of an image sensor 22 for the data acquisition for exposure control, and had prepared it with the conventional technique by it becomes unnecessary, and cost reduction and the degree of freedom of an appearance design can be raised. **.

[0061] Next, with reference to drawing 15 and 16, the gestalt of another operation of a CMOS mold image sensor is explained. Drawing 15 is the circuitry Fig. of the CMOS mold image sensor in the gestalt of this operation. As shown in drawing 15 , this CMOS mold image sensor has taken the configuration of a

two-dimensional array sensor, and it is arranged so that the unit pixel of the above-mentioned structure may be located in a line with the direction of a train, and a line writing direction in the shape of a matrix.

[0062] Moreover, the perpendicular shift register 102 which is the generating circuit of a vertical-scanning signal (VSCAN) is arranged on the left-hand side of the pixel field. The vertical-scanning signal supply lines v1 and v2 which have come out one [at a time] to it whenever it carries out to the gate of MOS transistor Qxxa in the unit pixel 100 located in a line with a line writing direction for every line from the perpendicular shift register 102 are connected, respectively.

[0063] Moreover, the level shift register 103 which is the generating circuit of a horizontal scanning signal (HSCAN) is arranged at the pixel field bottom. The source of MOS transistor Qxxa in the unit pixel 100 located in a line in the direction of a train for every train is connected to different perpendicular output lines h1 and h2 for every train. Each perpendicular output lines h1 and h2 are connected to every one drain of MOS transistors Q01 and Q02 as a different switch for every train. The gate of each switches Q01 and Q02 is connected to the level shift register 103 which is the generating circuit of a horizontal scanning

signal (HSCAN).

[0064] Moreover, the timing generator 101 which is the generating circuit of a shutter signal (VSHT) and a drain electrical potential difference (VDD) is arranged on the right-hand side of the image field. The drain electrical-potential-difference supply line which has come out of the timing generator 101 which is the generating circuit of a drain electrical potential difference (VDD) is connected to the drain of the MOS transistor in all the unit pixels 100 arranged two-dimensional, respectively. Furthermore, the shutter signal supply line which has come out of the timing generator 101 which is the generating circuit of a shutter signal (VSHT) to the gate of the MOS transistor in all the unit pixels 100 arranged two-dimensional is connected, respectively.

[0065] Moreover, the source of each switches Q01 and Q02 is connected to amplifier 105 through the common constant current source 104, and the output of amplifier is further connected to the output 106. That is, it connects with a constant current source 104 through Transistor Qxxa, and Q01 and Q02, and the source of MOS transistor Qxxb in each unit pixel 100 forms the source follower circuit of a pixel unit. Therefore, the potential difference between the gate-sources of each MOS transistor Qxxb and the potential difference between

the bulk-sources are determined by the connected constant current source (load circuit) 104.

[0066] The video signal (Vout) which drove MOS transistor Qxxb of each unit pixel, and is proportional to the amount of incidence of light serially with a vertical-scanning signal (VSCAN) and a horizontal scanning signal (HSCAN) is read. As mentioned above, since the unit pixel 100 consists of light-receiving diode Dxx and MOS transistor Qxxb, and Qxxa, the part of a pixel can be created using a CMOS technology. Therefore, scanning circuits 101-103 and a constant current source 104 grade circumference circuit can be created for a part for the above-mentioned picture element part to the same semi-conductor substrate.

[0067] The features of this component structure start exposure to all pixel coincidence like a progressive scan mold CCD image sensor, and are in the point which can be ended. This is effective when performing exact exposure control using the light source to which only short **** like a stroboscope emits light. In the usual CMOS mold image sensor, it reads 1 pixel at a time in order, or one line will be read at a time. In this case, although it is satisfactory in the usual exposure, exposure conditions are limited when performing exposure by

luminescence of a short time like stroboscope light. That is, while all pixels are being exposed, luminescence initiation must be carried out, and luminescence termination must be carried out. Exposure closing by stopping a transfer of a charge like this component cannot be performed.

[0068] Drawing 16 is the timing chart of each input signal for being concerned with the example using D11 as a pixel of the 2nd group, and operating the CMOS mold image sensor of the gestalt of this operation using the sensor of drawing 15 . Using the well field of p mold, when the transistor Qxxb for lightwave signal detection is nMOS, it applies. It sweeps out and component actuation is a period (initialization)-are recording period (exposure period)-read-out period. - It sweeps out and is a period (initialization). - It can carry out repeatedly like ....

[0069] Actuation of this configuration is stated to a detail. There are 0V and four values of VL (about 1V), VM (about 3V), and VH (about 5V) as an electrical-potential-difference value. It sweeps out and a period adds VH to VDD and VSH (t0). The charge accumulated in the carrier pocket under Photodiode Dxx and the gate of MOS transistor Qxxb by this can be swept out. After initialization is completed, VDD is set to VM and VSH is set to VL (t1). Thereby, a

charge is generated according to the quantity of light which carried out incidence to the photodiode, and the generated charge flows into the carrier pocket formed in the bottom of the gate of an MOS transistor. Exposure is started from here. A stroboscope is made to emit light in the second half of an exposure period (t3). Before a few [time of day t3], at time of day t2, read-out of the signal from I11 and D11 is started. Using h1, for every fixed time interval, a signal is read from D11, and it finds the integral, and goes. When a threshold with an integral value is reached, exposure is terminated in the place where the amount of luminescence of a stroboscope became a proper value. It is realized by setting VSH to VM from VL at this time (t4). The flow of the charge which was flowing into the carrier pocket under the gate of MOS transistor Qxxb from Photodiode Dxx during the exposure period by this stops, and exposure is completed. Read-out is started by operating a level shift register and a perpendicular shift register after this. For example, (t5) and the signal from Q11b can be read by setting H1 and V1 to H from 0V, respectively. The signal of all pixels can be similarly read with the combination of Hx and Vx. After reading all signals, it initializes by setting VDD and VSH to VH again, and prepares for the next exposure. After placing fixed time after this or completing stroboscope

luminescence, the signal from each pixel is read. Since the signal from the pixel containing D11 will already be read at this time, the charge seldom remains. The above-mentioned example uses 1 pixel of this as a photo detector using a 4-pixel sensor. Even if the number of pixels increases, it is fundamentally the same. Since the pixel of the 2nd group merely becomes plurality, the address is set up so that the signal from these pixels can read to coincidence, and the read-out transistor of each pixel may turn on. The read signal is added and read. The output signal when adding becomes large too much, and it is assumed also when exceeding the dynamic range of output amplifier. In this case, the clock for read-out is carried out early, in the pixel of the 2nd group, it crawls and it is [it collects into every / shoes or /, and all is not coincidence, and] also possible every 1 pixel and to divide and to read the signal for one screen. It will add and integrate with an output signal externally. Since it is indicated by JP,11-195778,A about the fundamental structure of the CMOS mold image sensor described above, for example, it does not indicate for details below.

[0070] As mentioned above, although this invention has been explained with reference to the gestalt of operation, this invention is limited to the gestalt of the above-mentioned implementation, and should not be interpreted, but, of course,

modification and amelioration are possible suitably. For example, not only stroboscope modulated light but this invention can be used for exposure control at large. Moreover, this invention is applicable to various kinds of photography equipments, such as not only an electronic "still" camera but radiography equipment.

[0071] Moreover, using only the pixel in which G filter appeared as a pixel of the 2nd group for exposure control data acquisition is also considered. Furthermore, it is not necessary to fix the location of the pixel of the 2nd group for example, in a central important photometry, the pixel of the 2nd group can be chosen from the pixel of the center of the image pick-up section, and, in an average photometry, the pixel of the 2nd group can also be chosen from the whole image pick-up section.

[0072] The terminal for image data acquisition and the terminal for exposure data acquisition may be shared, and a stroboscope quantity of light integral output terminal may be prepared independently. When scanning and reading the signal from the pixel of the 2nd group, it can also divide and read for every part. For example, since an important photographic subject is in a core in many cases, read from the core, it reads for every train or line, or reading spirally is also

considered. Memory (charge storage section) is prepared two in one pixel, and by recording separately the image charge before stroboscope luminescence, and the image charge after luminescence, the data before luminescence are unhurt and can be acquired. The proper quantity of light is estimated beforehand and light can be made to emit rather than exposure end time the part and before for control of stroboscope luminescence time of day.

[0073]

[Effect of the Invention] According to the image processing system of this invention, the photography equipment which can take a photograph on more proper photography conditions can be offered, maintaining cost low.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the representative circuit schematic of the CMOS mold image sensor concerning the gestalt of this operation.

[Drawing 2] It is the outline block diagram of the image sensor circuit 20 containing the image sensor of drawing 1 .

[Drawing 3] It is the outline block diagram showing the array of the pixel in the

image pick-up section 54.

[Drawing 4] It is a plugging chart for signal ejection at the time of using the image pick-up section of drawing 3 .

[Drawing 5] It is the outline block diagram showing the array of the pixel in the image pick-up section 54 concerning the modification of the gestalt of this operation.

[Drawing 6] It is a plugging chart for signal ejection at the time of using the image pick-up section of drawing 5 .

[Drawing 7] It is drawing showing the arrangement relation between a pixel and a filter.

[Drawing 8] It is drawing showing example with the another arrangement relation between a pixel and a filter.

[Drawing 9] It is drawing showing the outline configuration of the electronic "still" camera which is an example of the photography equipment concerning the gestalt of this operation.

[Drawing 10] It is a stroboscope luminescence property Fig.

[Drawing 11] (Photographic subject distance) It is drawing showing a stroboscope luminescence property in case x (diaphragm) is smallness.

[Drawing 12] (Photographic subject distance) x (diaphragm) is drawing having shown the stroboscope luminescence property at the adult time, respectively.

[Drawing 13] It is drawing showing the photography flows of control of the gestalt of this operation.

[Drawing 14] It is drawing showing the photography flows of control explained to a detail about the modification of stroboscope exposure control of drawing 13 .

[Drawing 15] It is the circuitry Fig. of the CMOS mold image sensor in the gestalt of this operation.

[Drawing 16] It is the timing-chart Fig. of the gestalt of this operation.

[Description of Notations]

2 Stroboscope

7 Comparator

22 CMOS Mold Image Sensor

23 Image Sensor Control Circuit

27 MPU

50 Image Pick-up Section

50a The pixel of the 1st group

50b The pixel of the 2nd group

51 Timing Generator

52 Perpendicular Shift Register

53 Level Shift Register

[Translation done.]